

SMART WHEELCHAIR

Project report submitted in partial fulfillment of the requirement for the
degree of Bachelor of Technology

In

Computer Science and Engineering/Information Technology

By

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To



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CANDIDATE'S DECLARATION

I hereby declare that the work presented in this report entitled “**Smart Wheelchair**” in partial fulfillment of the requirements for the award of the degree of **Bachelor of Technology in Computer Science and Engineering/Information Technology** submitted in the department of Computer Science & Engineering and Information Technology, Jaypee University of Information Technology Waknaghat is an authentic record of my own work carried out over a period from August 2018 to Dec 2018 under the supervision of **Dr. Hemraj Saini**, Professor Senior Grade in Computer Science & Engineering and Information Technology.

The matter embodied in the report has not been submitted for the award of any other degree or diploma.

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This is to certify that the above statement made by the candidate is true to the best of my knowledge.

Dr. Hemraj Saini
Professor Senior Grade
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Dated:

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Abstract

When the old age arrives, it ends up important to check our old ones for their wellbeing and security. Because of weakness and feeble joints they have great danger of falling down. Presently it is important to know whether a mature individual has fallen for his own safety. Likewise, individuals on wheelchair should be checked for fall location, and to check how much he is affected by the fall. For this reason, we propose a keen help framework utilizing IoT (Internet of Things). The framework utilizes accelerometer and gyration sensor to recognize individual movement.

It very well may be mounted on individual's hand or wheelchair for discovery. The sensor is associated with a microcontroller so to check continually the increasing speed information. Presently the framework continues observing. An unexpected sudden change in acceleration in the framework is treated as a fall. What if in the event that the individual did not fall and caution was false, the framework permits to stop the alarm if individual presses snooze in 5 seconds. On the off chance that individual does not press the button, framework identifies individual has fallen and naturally triggers the alarm through Wi-Fi module which send the message to friends and family of the individual instantly.

IoT will decrease work by client just as it gives productive work in light of which getting to the system will get simple work. It will decrease the human work endeavors.

Chapter-1

INTRODUCTION

Introduction:

On applying conduct based brilliant robots to profit endeavors has deliberated. By stimulated degree of developing the people existence represented in various past-present day nations, enthusiasm aimed at progressively mechanical assistive structures for individuals with bodily diseases or cost of cerebral control is required augment. It's an evidently genuine presentation zone of organization machines soon. In Cartesian mechanical innovation, on which most ordinary approaches to manage sharp apply independence are built, "affirmation" to the earth, trailed to prepare for a period of development progression and estimation of components for orchestrated progress, have a point of convergence for equally speculative awareness and exercise. By grasping a lead built technique wheelchairs can gathered which can work step by step in complex genuine circumstances with extended execution in capability, security, and flexibility, and staggeringly decreased computational essentials. Also, redesigns in the life and smooth degradation characteristics are ordinary from this methodology.

In the mid year of 1995, independence the official's organization for a monetarily existing Canadian-made wheelchair was effectively arranged & completed by improvement gathering. Given structure thinks about equally longitudinal (onward and in switch) as well as exact (leftward and rightward) advancements of seat. Moreover, realized on the project capacity to do "affirmation" of earth sought through confined verbal coordinated efforts with customer. The outcomes were appeared August 1995 at an event called "The Intelligent Wheelchair" made via "David Miller" at the "International Joint Conference on Artificial Intelligence (IJCAI'95)" in Montreal. Disregarding a little progression period, the seat achieved incredibly well praise at the showcase. Enabled by fundamental accomplishment, settled a multi time's mean to make a significantly independent control wheelchair to use by people for various sorts and steps of debilitate. the adroit wheelchair adventure, presently named TAO Project, aim to develop

procedure for structure, complete, and check an incredible additional independence the board system for utilize identified with most typical monetarily open power wheelchairs. With the true objective to show the standard, the endeavor will work, in an amazing midst, a freedom the officials structure for a couple of settled in electric wheelchair models starting at now open accessible all through North America as well as Japan. In 1995, a association called sister R&D was developed in Japan intended for the improvement of canny robotized progressions in favor of the debilitated and developed. By means of this fresh R&D gathering, the headway of TAO-2 independent wheelchair with a modernly open Japanese wheelchair started in the spring of 1996 which started the revolution.

In light of our understanding, systems used & a couple of challenges linked to the utilization of the direct loom to manage comprehend a watchful wheelchair and probably other parts associated with this advancements are analyzed. A short report is in like manner shown of various social events who are working in this zone.

With respect to position, it ends up critical to screen the elderly people for their prosperity moreover, security. As the deficiency and weakness in joints, they have an inconceivable danger of tumbling or much worse hurting them. By and by it's fundamental to identify whether a development individual has fallen with the objective that he/she can profit by outside intercession on schedule. Also the person on wheelchair ought to verify for fall distinguishing proof. Consequently we recommend a sharp fall revelation scheme. The system use accelerometer and gyroscope as a sensor to perceive singular advancements, the sensors can be worn by individuals on the hand or wheelchair according to his convenience. The feeler is related with a microcontroller with the true objective to continuously pass on the accelerating information. By and by this method keeps watching for the fall distinguishing proof & surprising improvement shift up close and personal. An abrupt unexpected alter with yank in the device is taken as a fall. By and by if the individual fail to fall and alarm siren was false, the structure grants to rest the caution if singular button rests get in 5-10 seconds of the fall. If individual does not push the buzzer, the algorithm distinguishes individual has tumbled down and normally triggers alarm through Wi-Fi module with caution the family members of the person about the location right away.

Stress of dropping would conceivably downsize physical exercises prompting declining social associations and inevitably bringing about sorrow. When it includes development, it ends up important to watch our ongoing ones for his or her wellbeing and security. In light of shortcoming and frail joints they need a decent danger of tumbling down. As of now it's important to comprehend if partner degree adult has fallen all together that he/she will get auspicious conveyance of medicinal assistance. conjointly people on wheelchairs should be checked for fall location to limit [1] the results of a fall.

Objective :

Most goal of the product is to shape a response to hinder the serious results of a fall while giving an advantageous utilization of the product comparatively as alarm once a fall occasion has happened. This is frequently completed the work of sensors like a turning component to experience the individual's introduction and quickening, a heap detecting component to experience the weight of an individual United Nations office is on a seat, a Wi-Fi module and a little controller that sends the general readings to caution the included people. this strategy is shaped advantageous to use by making it a wearable gadget which will be worn on the hand or snared to a seat.

Future has expanded at the rate of a long time since start of 21st century because of advancement in the therapeutic ground. As indicated by the “World Health Organization (WHO)”, by 2050 the present populace of older individuals will increment, speaking of about 20% of the total populace.

- I. Based on given patterns, numerous nations are receiving sound maturing strategies with the point of helping older individuals lead a functioning and free life.
- II. Specifically, guaranteeing dynamic and solid maturing (AHA) of the old individuals is one of the best difficulties, yet in addition an incredible open door intended for civilization in the future decades. Thought of AHA former of late portrayed as a wide idea, for the looks to develop the personal satisfaction (QoL) the individuals as they become old, upgrading open doors designed for the wellbeing, support and security. In this logic, medical issues of the old individuals comprise turned out to be progressively

earnest and falls are the most widely recognized mishaps whose seriousness may frequently require restorative consideration. As indicated by the WHO, around 30% of the general population more than 65 endure coincidentally at least one falls for each year, and for the general population more than 70 years with given pace increments to achieve half. This number is additionally disturbing on the off chance that one thinks about that falls frequently occur in indoor conditions and are identified with ordinary exercises of everyday they live in. A genuine outcome of enduring a fall down is a "long untruth" that comprises the staying on the floor for significant lot of instant until assistance came to aid.

- III. This "long falsehood" can also be prompt genuine wellbeing difficulties, including lack of hydration, pneumonia, and hypothermia, which much of the time, can prompt passing inside a half year after a fall. In this manner, a fall not aided time in an older individual can contrarily affect QoL as well as freedom.
- IV. In each unique circumstance, IOT frameworks to add recognize drop and ready crisis benefits on time is just a public demand. Now days, a few arrangements have been projected for the elderly person to identify the fall. These arrangements are ordered into 3 primary sorts as indicated by the sensor-innovation utilized: "Non-Wearable Based Systems (NWS), Wearable Based Systems (WS) and Fusion or mixture based Systems (FS)". Specifically N W S frameworks for utilization image based gadgets. In any case, if primary burden of the frameworks is their staggering expense & resulting need security to keep an eye on old individuals because of these frameworks necessitate that the sensors should be deliberately appropriated in the indoor condition where the old lives. To defeat this confinement, WS frameworks has been anticipated, which for the most part utilize inertial sensors, for example, accelerometers and spinners, regularly connected to the body of the older for development acknowledgment when a fall happens. Specifically, accelerometers are being utilized progressively in WS frameworks since they offer favorable circumstances, for example, low power utilization, minimal effort, low weight, simplicity of activity, little dimension, can be worn on the different parts of body areas and, above all, compactness. Therefore, a standout amongst the most usually utilized strategy for fall recognition includes the utilization of a tri-pivotal accelerometer alongside an edge based calculation, which can be utilized by a few delegate works. This

algorithm recognize a fall when the increasing speed originating to a three way hub accelerometer installed in a gadget is away of the rest limit. The greatest favorable circumstances in utilizing limit built strategies has low unpredictability and calculation effect the contrasted with different techniques. In any case, finding a proper incentive for the limit that permits recognizing all kind of falls lack in taking mistook for a few ADL, also demonstrated to a confounded issue. As of late, WS frameworks dependent on AI (ML) systems is projected to manage all the drawbacks and progress precision for identifying falls. Machine Learning is a strategy in software engineering so as to includes factual induction of model starting information so as to make computerized forecasts.

Taking an example, Mezghani utilized a non-direct help machine strategy to separate the highlights also to acquire important from the person's information caught by the accelerometer connected with shrewd material. As it require two component withdraw: To recognize the pinnacle and the other to identify the collapse introduction, it needs all the careful handling contrasted with some calculations completing a just withdraw. By removing moment arrangement from person movement recovered by a three way pivotal accelerometer set by the person upper shaft Ton utilized covered Markov Model (HMM) which is built on strategy recognize and anticipate drop. Trial outcome demonstrate a perfect achievement rate in the fall identification (100% affectability and 100% explicitness). In any case, for preparing and site HMM (λ) also limits of given framework, information tests of youngsters' recreated exercises were utilized. What's more, this framework does not alarm when a fall occasion happens. At last, Aguirre utilized cell phone worked with accelerometer for relentlessly checking the development's information of older individuals. These information were utilized to analysis disconnected tri-diverse learning classifiers which are Decision Trees, K-Nearest Neighbors and Naive Bayes. As the outcomes demonstrate the choice trees-formed calculation exhibited the best execution, with much equilibrated affectability as well as explicitness esteems contrasted and the other tried calculations. In any case, because of the generally high vitality utilization of cell phones, this framework must be dynamic for a brief timeframe. The choice tree-based calculations is picking up acknowledgment and is most likely the best way to deal with increment the exactness and accuracy for the identification of the fall. Also a pursued a comparative methodology in given paper by utilizing choice trees-built on Big Data method for

discovery of the fall, however in contrast from past plant in the way the framework is fabricated. To start with, the information from the developments of older individuals in enclosed condition to catch a 3D-pivot accelerometer installed keen on a little PAN gadget wearable. Also, the drop of a senior is distinguished with choice trees-built Big Data method as is fabricated as well as cloud preparation. At first, it's prepared by authentic learning to an public dataset that takes records of tumble down of old individuals. Therefore, the model learns of the fall occasions identified by the framework.

The principle advancements of given model is that keeps running on an asset obliged gadget, a Smart IoT entryway which gives mist registering capacities that empower fall-location related handling locally so as to lessen the season of "long falsehood". At the point where fall takes place is distinguished, the Intelligent IoT portal fits for delivering threats, as record of the fall & area of older individual's home, to social insurance experts by a trivial and safe IoT convention. Furthermore, the neat IoT Gateway additionally gives operation with in and information change in way to ensure framework to coordinate in comprehensive manner to analyze frameworks or IOT Platforms. At last, the fall occasions recognized is put away in the cloud for giving increasingly exact data to social insurance experts. Also, this information are utilized to assemble another model each moment a drop is identified, as well as is ensuing increasing with Intelligent IOT access. Presentation of given FD-framework also be affirmed as far as exactness, accuracy and addition.

System architecture to identify Fall The framework projected comprises by the four principle segments: A wear gadget, remote correspondence organize, a Intelligent IOT passage also Cloud administrations. Every part assumes a significant job in recognition of falls. The FD-framework wearing gadget A model of wearing gadget be built since the mix of three measured squares. Computerized signal handling with low power and low voltage task. The sensor board comprises of a few little ultralow-control sensors. In any case, just the MEMS movement sensor (LSM6DS0) is utilized for social affair the movement information that occur when the grown-up is diminishing or either performing ADLs. It is 3D-pivot accelerometer as it works with a all-out increasing speed run ($\pm 2/\pm 4/\pm 8$ g). The wearing gadget framework depends on "Contiki", an unwrap resource working framework created to obliged systems. By utilizing the "Contiki OS"

and obtain full IoT stack hold over 6LowPAN, at the end of the day, RPL. 6lowPAN and CoAP support. Erbiium given here is a low-control REST motor in C language to gives relaxing access to the assets of the wearing gadget.

Moreover, REST worldview, intrinsic in the obliged function convention, has been abused. CoAP is a trivial IoT convention that imparts likenesses to HTTP as it incorporates asset deliberation, URI, restful association (i.e., strategies, for example, GET, PUT, POST and DELETE for getting the different assets), and extra description alternatives. Be that as it may, contrasted and HTTP, CoAP execution utilizes negligible assets on the obliged gadgets and the compelled systems. Thus, it appropriate for compelled situations in IoT. CoAP Server worked in the wearing gadget to perusing accelerometer' estimations. The estimations of occasionally recovered utilizing the CoAP GET strategy for the individual asset way of counting the IPv6 address and docks of the CoAP Server as appeared in the Increasing speed Resource and related CoAP Path Parameter depiction Sensor LSM6DS0 Resource Acceleration and Resource way to GET 5683/sensors/quickenning. Remote statement system The remote correspondence among gadgets and the Intelligent IoT portal to built up by low-control remote IPv6 innovation dependent on the IEEE standard. 6LoWPAN is an innovation intended for sustaining the availability, interoperability, resemblance of diverse WSNs at an exceptionally minimal effort and with extremely low necessities contrasted and different advancements, for example, Wi-Fi, Bluetooth. Also, the innovation is natural favorable circumstances; more noteworthy versatility, greater location space, simple sending and keeping up, what makes this innovation reasonable to be utilized in IoT-empowered gadgets, particularly in asset obliged gadgets. We assemble and send a 6LoWPAN system made out of two 6lowPAN hubs: a wearable gadget and a 6lowPAN Border Router (6LoBR). 6LoBR assumes a significant job in correspondence within and external of 6LowPAN system. The 6LoBR given mindful of trade information between wearing gadget and cloud administrations also give sending as well as directing capacities within the 6LoWPAN system. In order to work, the Intelligent IoT passage assumes the job of 6LoBR. Brilliant IoT access IoT Gateway is the input segment for fall recognition and comprises of four modules: interoperability, information change, huge information analyzer, crisis cautions handler.

Methodology:

Smart IoT Gateway goes about as a scaffold for 6LowPAN system and cloud administrations, hence empowering the network and consistent correspondence all the framework's parts. As gives convention transformation works that incorporate 6LowPAN progress systems - IPv6/IPv4 as well as message interpretation among CoAP as well as MQTT conventions. Information change performs 2 capacities. One is, it gets the development information (j, k and l increasing speed esteems) and perform sifting utilizing initial request IIR channel, and then again, it comments on and maps information in a comma-isolated esteem (CSV) document group. Each sifted increasing speed esteem is put away close by to utilized it for contribution to the huge information analyzer element. Huge Data collector and analyzer is in charge of preparing and breaking down increasing speed esteems in the j, k and l tomahawks distinguish if qualities speak to a fall. Before discovery of the fall, it begun by made and organized a characterization form dependent on choice foliage from the information of past occasions (falls information). This means are made in the cloud. Authentic information fundamental to comprehend that conduct is normal. Taking an example, utilizing information of conduct of startling movement designs that enclose happened when a grown-up fall, will empower cautions and foresee circumstances of hazard when comparative examples of conduct happens. The falls discovery includes three stages delineated, and depicted in more detail in the accompanying content.

Step 1 Creation of Model: A choice trees-built model is worked from Sis-Fall dataset (definite underneath). The choice is generally utilized for information grouping, and as it a standout amongst the finest strategies for characterization and relapse among numerous different calculations as it utilizes a non-parametric basic plan which makes it viable for taking care of expansive mass datasets devoid of the overfitting issues extremely regular in other calculations. Moreover, choice trees can be effectively changed over to arrangement rules. We use full-size ML Data Analysis apparatus to make the model. Large ML is a product as-a-support of ML, intended to make prescient models and install them into programming functions by RESTful APIs.

Step 2 Model preparing: In our effort, the Sis-Fall account are utilized at first to prepare the form. Consequently, the system learns of the fall occasions identified by the Intelligent IoT access. Sis-Fall is a lot of freely accessible information for benchmarking as well as creating the fall identification frameworks. The given dataset gather records from 38 members, of which 15 are old people matured somewhere in the range of 60 and 75 years of age. Every single old member's reproduced exercises of ADLs and just a solitary one of these members recreated the two falls and ADL.

Stage 3 Prediction: In request to location of accident, the enormous information analyzer makes a nearby case of the system. The expectations are made and registered captivating as info information the data originating from the change section by utilizing the REST APIs as shown in BigML. On off chance that the consequence of forecast is a drop, the framework conjures to the crisis ready manager and transmits the falls information to the wifi module administrations.

Crisis alarms manager sends warnings of fall occasion alongside the GPS position of old individual's home to the gatherings in charge of the consideration of the old individuals recently enrolled in the framework utilization. The given fig. demonstrates a case of the warnings sent. This data likewise is sent to the cloud administrations. MQTT is picked on the grounds that it is a lightweight and secure IoT convention. MQTT gives start to finish verified correspondence and unwavering quality dependent on SSL. What's more, it consolidates a few dimensions of nature of administration to affirm the conveyance of communication, on or after a non-ideal least dimension (QoS0) to a twofold acknowledgment level. Since our framework is firmly identified with the old's human services, the dimension of the nature of administration QoS 2 is designed to ensure the unwavering quality of the conveyance of the messages. Like the wearable gadget, all activities of 6LoBR hub are performed on "Contiki" operating system. To empower correspondence to 6LoWPAN hubs and Intelligent IoT entry, RPL is arranged. Then again, to interpret bundles originating in between 6LoWPAN hubs and IPv6/IPV4 bundles and the other way around.

2.4.Cloud Services get the data from IoT access and collect the data utilizing MongoDB. When a fall happens, the system is again made and prepared to collect data in cloud utilizing the API REST, for its resulting privately started in the door.

3. Evaluations For assessment of the projected framework, sum of 12 restricted investigations were taken in account: 9 examinations to check the falls and 3 tests of ADLs. Three people (volunteers) took an interest in the tests. The wearing gadget was set on the person's midsection. The falls were mimicked specific request. At first, some testing were executed to tune the framework. The outcomes got after the tests are broke down utilizing different measurable function like accurateness, correctness, increase or Recall. These functions are characterized for ideas of genuine positive (TP), genuine negative (TN), false positive (FP), and false negative (FN) as pursues: Terms genuine and negatives are utilized for allude to the nearness/nonappearance of state in premium, fall. Genuine positive are fundamental examples to intrigue when genuine negative are largely different cases.

4. Conclusion The term IOT is another worldview in help of grown-up populace to advance their personal satisfaction via encouraging an inescapable as well as progressively customized type of consideration. The examination displayed FD-framework, an IoT framework for discovery of fall of older individuals dependent over Big Data model that utilizes through Machine Learning preparing methods dependent on choice trees. Authentic learning from an public dataset of falls and also the ADLs were utilized for construct and preparing the system, which keeps running on a Intelligent IoT access that gives haze figuring capacities. To foresee the falls, the FD-framework continuously takes as info the increasing speed estimated in the j, k and l tomahawks originating the old's developments, which gathered with 3Dimensional-hub accelerometer inserted in 6LowPAN via wearing gadget. The gadget sets on the old people midsection, and it provides an appropriate answer for be utilized by any older individual in an indoor situation. The framework remotely alarms the medicinal services experts, crisis focuses, guardians and old's relatives for the situation that a fall occasion happens utilizing QoS systems. Moreover, it ensures the consistent interoperability by empowering correspondence ways in different framework's segments via the Intelligent IoT entryway by means of convention change capacities.

Chapter-2

BREIF REVIEW OF THE FIELD

Coming up next is a portrayal of research on savvy wheelchairs that has been driven and still constant at a couple of foundations. The examination isn't wanted to be done yet to give an idea of the particular approaches used.

2.1 “IBM T.J. Watson Research Center”

Undoubtedly, the fastest work in terms of watchful wheelchairs was a structure completed by Connell and Viola, with a seat mounted on a robot to be comfortable. Mr. Ed, as the seat was called, could be confined by the customer to a joystick mounted on the arm of the seat and connected to the robot. Likewise, the client could transfer control to the structure itself to play explicit boundaries, for example avoiding obstacles or looking for other things in motion. Despite the joystick, the robot 's involvement with the circuit breaker on the front and back of the robot, eight proximity proximity proximity sensors and two sonar sensors on the front of the robot for the near - course start things like this. The controller is handed over to the robot by a movement of switches from the client.

A layered practice approach was used to control the improvement of the seat. These have been divided into capacities with the individual approaches of the standards and become a reserve of instruments to achieve a specific objective. These social issues could be jeopardized or mitigated by strategies for administrator-restricted changes. It worked as a relationship in which the machine did the typical work and the customer chose what should be done.

2.2 “KISS Institute for Practical Robotics”

Established in Virginia, the KISS Institute for Applied Self-Sufficiency Practice (KIPR) is a non-profit educational organization that conducts research and development to coordinate mechanical innovation in the Advancement of Attendance, the Independence of Space Application and Free Submerged Vehicles, and to prepare for mechanical innovation and related topics realizes fields. David Miller and Marc Slack of the KISS Institute have made Tin Man I and II. Tin Man II, shown in Figure 1, shows an invaluable wheelchair control between the joystick and the standard wheelchair motor control. The sensors located near the seat keep the seat away from obstructions and find openings with the least customer participation. It was tested with two electric wheelchairs, Elements and Penny and Giles.



2.3 “CALL Center, University of Edinburgh”

The CALL Center at the University of Edinburgh has developed the CALL Center Smart Wheelchair. Initially, it was developed as an inductive source of information and medical resource for unbelievably disabled children. The seats should help to examine and improve physical, academic, social and insightful skills. Thirteen seats were built and evaluated in three neighboring schools, one outside a private care center and three in precompetitive facilities. The seats are balanced electric wheelchairs, controlled by the PC and can be controlled by various strategies, eg. As switches, joysticks, PC and voice output. It is estimated that the mechanical, electronic and programmatic configuration accelerates the development of new boundaries, lowers the cost of individualized systems and creates a modelless structure. Because there are no modes, the tests are directly connected to the client. An express subsystem called Observer has been configured to tell the client what the system is doing. The observer responds and communicates his or her perceptions to the customer through a conversation synthesizer or data gadget. The element continues to run on multiple 80C552 processors that undergo methods for sequential I2C mapping by observing the sensors and client orientations. The questions or social problems of things define modules that contain explicit utilitarian messages. Each alternative study involves numerous tasks. The construction of practices, each of which fulfills an explicitly utilitarian mission, resembles Brooks' subsumed architecture.

2.4 “Nagasaki University and Ube Technical College”

[Wang et al., 97] use existing indoor ceiling lights as places of interest for autoinclusion of an automated wheelchair. As such, the seat is limited to use in a chair of the University of Nagasaki, whose organization is known in advance. An azimuth sensor is used to indicate the edge between a specific point and a particular interrogation, and a fantasy sensor detects the lights on the

ceiling. The lights on the ceiling are still used as places of interest when lights are missing. The azimuth sensor and the reversing edge of the two wheels provide the information that is essential for the continuation of the sitting route. Two CCD cameras are used, one of which is used to distinguish the places of interest on the roof and the other to identify objects that were pioneers with the laser. The laser manufacturer transmits an incision beam, which is perceived by the CCD camera. The image banner is created by a base circuit created with an FPGA, which indicates to the controller when the area is clear or the verifications are in place. In twenty preliminary rounds in a concert with ten ceiling lights, the best position was 0.35 meters and the most extraordinary presentation sweep was 17 degrees.



Figure 2: Chair used by Nagasaki University

Chapter -3

SYSTEM DESIGN

3.1 HARDWARE SPECIFICATION

3.1.1 ATmega328P AVR MC

Based on Microchip pico's 8-bit AVR, the AVR RISC microcontroller combines 32 KB ISP flash memory with read limits, 1024 GB EEPROM, 2 KB SRAM, 23 very valuable I / O lines, 32 useful working records, 3 versatile clocks / Counters with respect to the modes, the inside and the outside interfere with successive programmable USART, a consecutive 2-wire interface organized in bytes, consecutive SPI ports, a 6-channel 10-bit A / D Transducer, clock Programmable monitoring dog with internal oscillator and five selectable power saving modes for programming. The device operates between 1.8 and 5.5 volts.

By running stun rules in a single clock cycle, the apparatus achieves power that increases to 1 MIPS per MHz, changes the application of force, and takes speed into account.

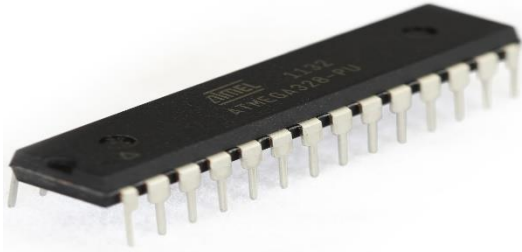


Figure 3: ATmega328P AVR MC

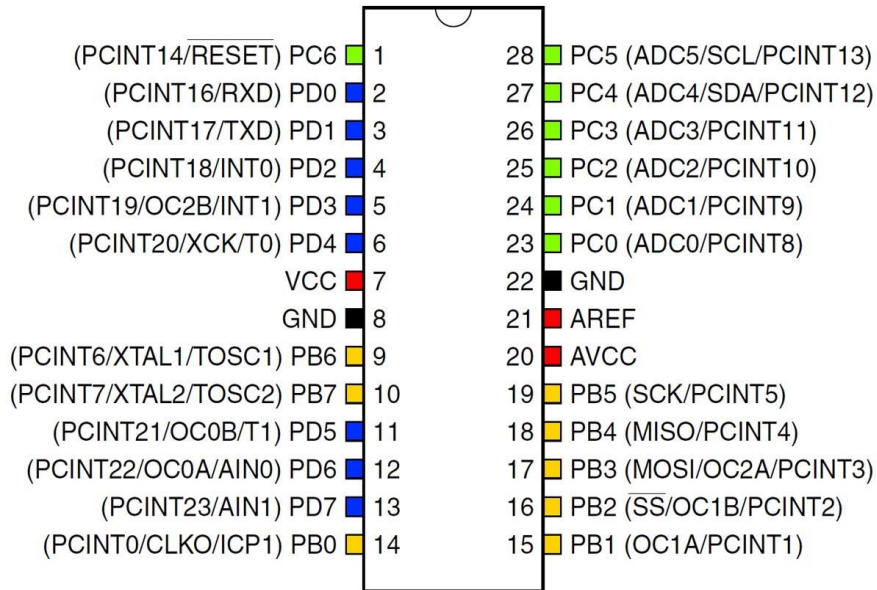


Figure 4: Pin diagram of ATmega328P AVR MC

3.1.2 Accelerometer & Gyroscope

Gyroscopes or gyroscopes are devices that measure or maintain the rotation movement. Accelerometers are the measure of the increasing speed that results from the speed of a protest. Measure the square meters per second (m / s^2) or in powers G (g).

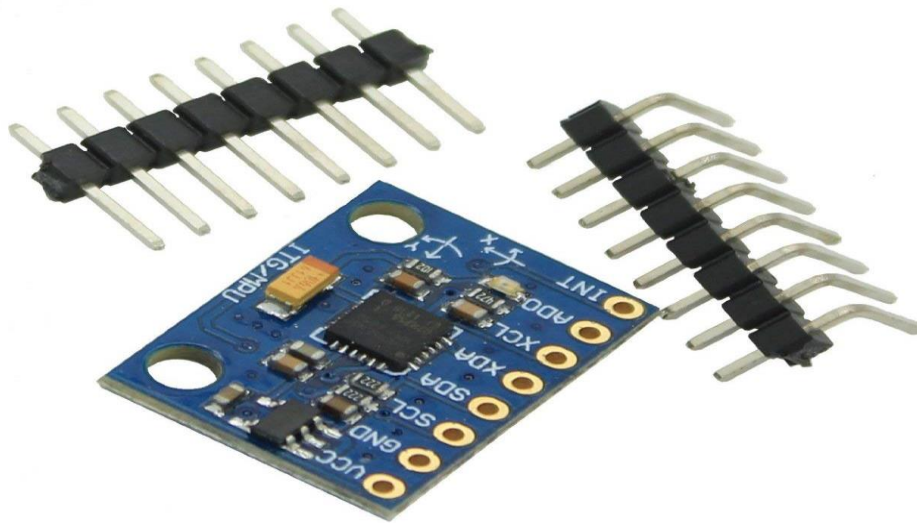


Figure 5: Accelerometer & Gyroscope

3.1.3 ESP8266 Wi-Fi Module

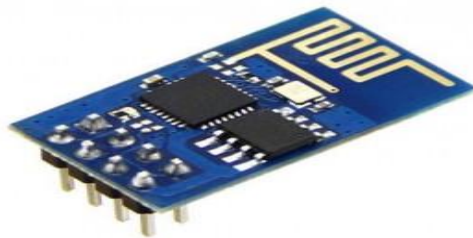


Figure 6: ESP8266 WI-FI MODULE

3.1.4 Cables & Connectors



Figure 7: Cable & connectors

3.1.5 TRANSISTOR (BC558)

A transistor is a semiconductor device consisting of three regions separated by two PN points of intersection. The three areas are Base, Issuer and Collector. The base may be of N-type or P-type. The manufacturer and the collector have the same pollutant effects but are unique in terms of base. In the remote possibility that the base is of the N-type, at this point the producer and the authority are of the P-type, then the transistor is called PNP-transistor and conversely the transistor is called NPN-transistor. The carriers of Lion's Share are not always producers and collectors. The base provides an interface for the legitimate collaboration between the producer

and the collector. The electrons are charge carriers of dominant parts in the N-region and in the P-region the openings are charge carriers of the lobe part. Therefore, two types of carriers are activated by the movement of current through the transistor N-P-N or P-N-P.

By executing stunning rules in a lone clock cycle, the contraption achieves throughputs pushing toward 1 MIPS for each MHz, changing force usage and taking care of speed.

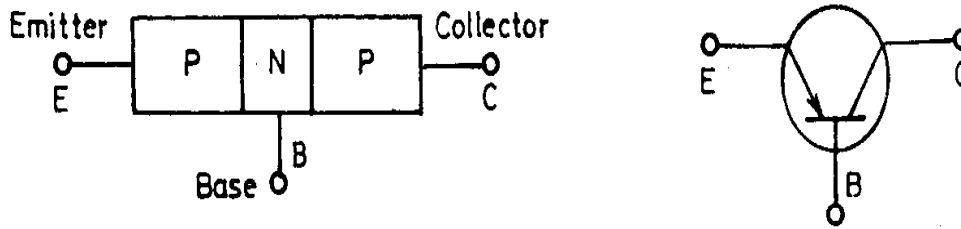
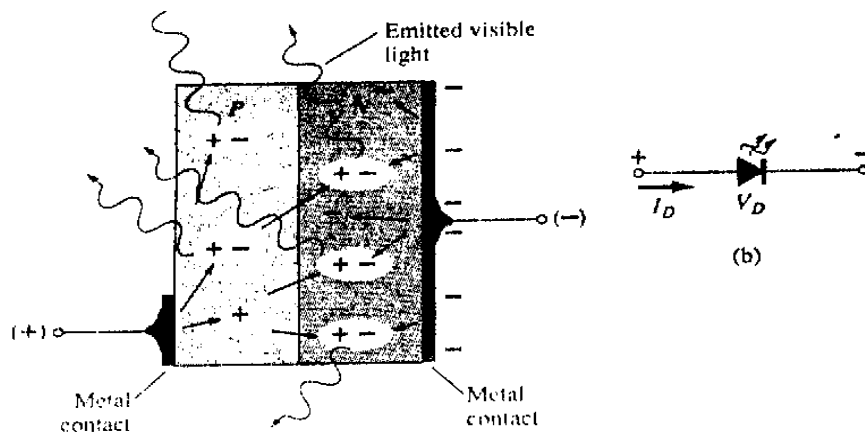


Figure 8: Transistor(BC558)

3.1.6 LIGHT EMITTING DIODE

Driven falls within the group of PN intersecting devices. The LED (LED) is a diode that emits an obvious light when it is excited. At each forward unilateral PN intersection, there is a recombination of openings and electrons within the structure and substantially close to the intersection. This recombination requires that the vitality governed by the unbound unbound



electron be changed to another state. The path to light emission through the application of a vital electrical source is called electroluminescence. As can be seen in the figure, the main surface associated with material P, with its realistic image, is much smaller to allow the development of most photons with luminous vitality.

Figure 9: Light Emitting Diode(LED)

3.1.7 Arduino Compiler

The most well-known rendition of Arduino is the Arduino Uno. This board is the thing that a great many people are discussing when they allude to an Arduino. In the following stage, there is a progressively complete summary of its highlights.



Figure 10: Arduino UNO

Arduino NG, Diecimila, and the Duemilanove (Legacy Versions)

Inheritance variants of the Arduino Uno product offering comprise of the NG, Diecimila, and the Duemilanove. The significant thing to note about heritage sheets is that they need specific component of the Arduino Uno. Some key contrasts: The Diecimila and NG utilize an ATMEGA168 chips (rather than the more dominant ATMEGA328), Both the Diecimila and NG have a jumper beside the USB port and require manual determination of either USB or battery control.

The Arduino NG necessitates that you hold the lay catch on the board for a couple of moments before transferring a program.

Arduino Mega 2560

The Arduino Mega 2560 is the second most ordinarily experienced variant of the Arduino family. The Arduino Mega resembles the Arduino Uno's beefier more established sibling. It brags 256 KB memory (multiple times more than the Uno). It likewise had 54 info and yield pins, 16 of which are simple pins, and 14 of which can do PWM. Nonetheless, the majority of the additional usefulness comes at the expense of a somewhat bigger circuit board. It might make your venture all the more dominant, yet it will likewise make your task bigger. Look at the authority Arduino Mega 2560 page for more subtleties.

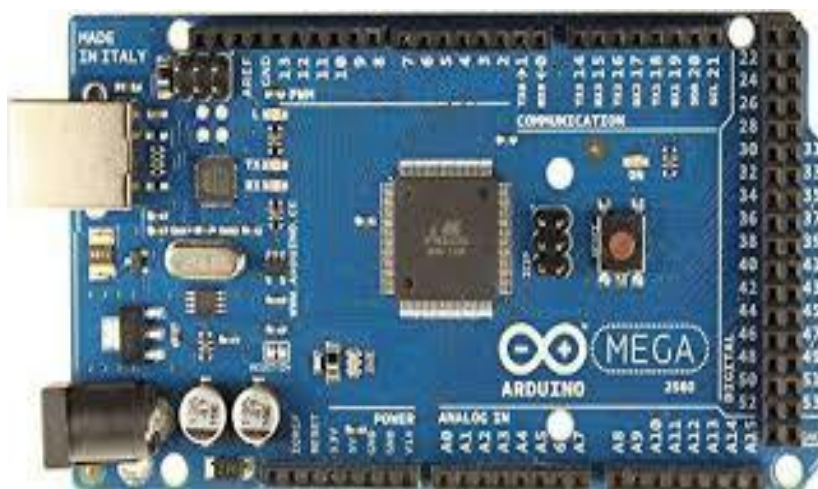


Figure 11: Arduino Mega 2560

Arduino Mega ADK

This special version of Arduino is basically an Arduino Mega, which was developed specifically for interacting with Android smartphones. This is an older version now.

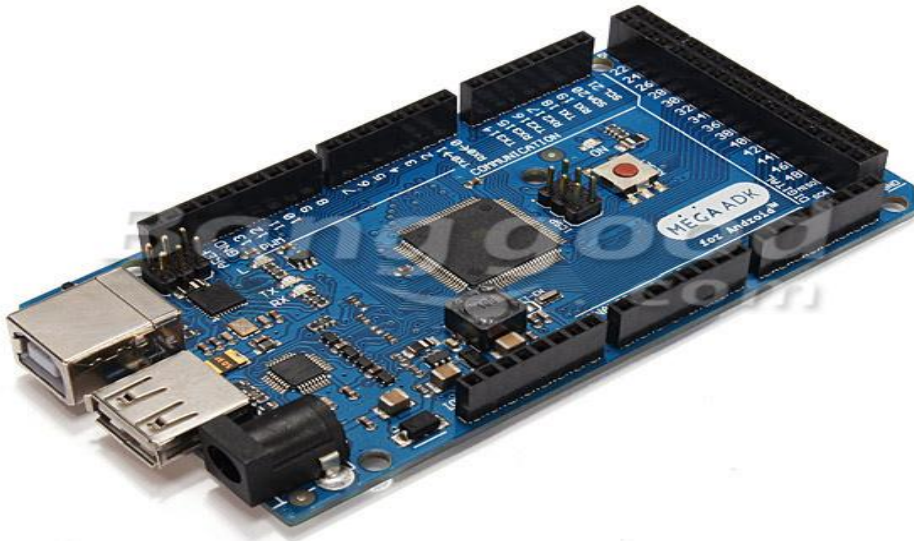


Figure 12: Arduino Mega ADK

Arduino Yun

The Arduino Yun uses an ATmega32U4 chip instead of the ATmega328. Anyway, what really sets it apart is the expansion of the Atheros AR9331 microchip. This extra chip allows this forum to run Linux regardless of the typical Arduino workspace. As much of this is not enough, it also has locally available WLAN capability. At the end of the day, you can program the board to do things the way you would with another Arduino. However, you can also go to the Linux side of the board to connect to the web via Wi-Fi. The Arduino side and the Linux side can then effectively communicate back and forth. This makes this board incredibly innovative and flexible. I hardly start to point out what's below, what you can do with it, but for more information, check out the [Arduino Yun Authority website](#).



Figure 13: Arduino Yun

Arduino Nano

If you want to be smaller than the standard Arduino board, the Arduino Nano is for you! Based on a surface mount ATmega328 chip, this version of the Arduino has been reduced to a small footprint suitable for confined spaces. It can also be used directly in a breadboard, which makes the prototype easier.

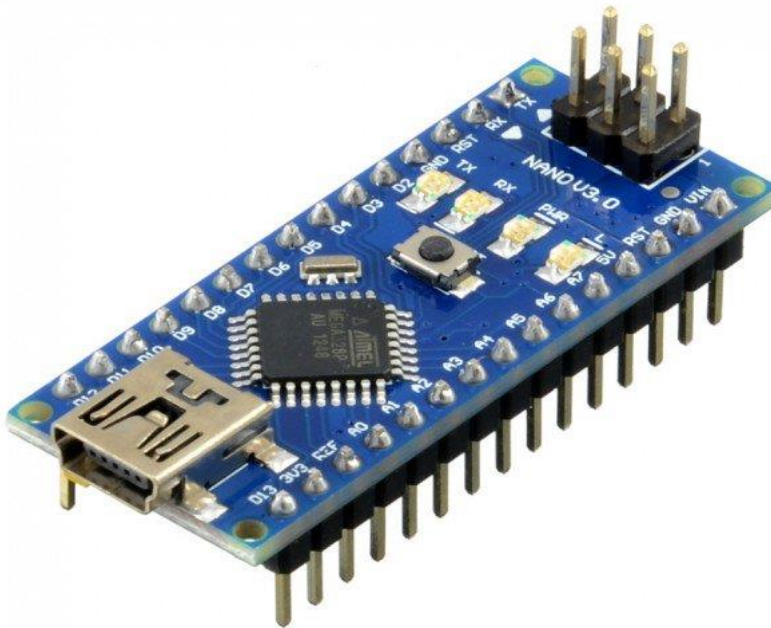


Figure 14: Arduino Nano

Some people think of the whole Arduino board as a microcontroller, but this is wrong. The Arduino board is truly an exceptionally structured board for programming and prototyping with Atmel microcontrollers.

The interesting thing about the Arduino board is that it is usually modest, connected directly to the USB port of a PC and is very easy to set up and use (unlike other improvement sheets).

Part of the main highlights of Arduino Uno are:

An open source plan. Open source has the advantage of having a large network of people who use and investigate it. This makes it easy to locate someone who will allow you to investigate your company.

A simple USB interface. The card chip is connected directly to your USB port and registered on your PC as a virtual sequential port. That way, you can create an interface that looks like a sequential gadget. The advantage of this setup is that sequential matching is an incredibly simple (and proven) convention, and associating it to current PCs via USB is extremely beneficial.

Convenient card power supply and implied voltage regulation. You can connect an external power source with a voltage of up to 12V and direct it to 5V and 3.3V. It can also be easily operated through a USB port without external power supply.

A microcontroller "mind" easy to discover and extremely cost-effective. The ATmega328 chip costs about \$ 2.88 on the Digikey. It has an infinite number of decent features such as clocks, PWM pins, external and internal intrusions, and various states of rest. More details can be found in the authority data sheet.

A 16 MHz clock. This does not make the microcontroller faster, but fast enough for general applications.

32 KB main memory to store your code.

13 advanced pins and 6 simple pins. With these pins, you can assign external devices to your Arduino. These pins are the key to extending the Arduino's recording capability to this current reality. Put your devices and sensors in trials that are compared to each of these pins, and you're a good idea to go.

An ICSP port to bypass the USB port and legitimately connect the Arduino as a sequential device. This port is important to recharge your chip if it fails and you can not ever talk to your PC again.

An integrated LED, which is connected to the computer's 13 stick, allows for a quick and easy code solution.

3.1.8 GSM Module

A GSM module is essentially a GSM modem (such as the SIM 900) connected to a board whose various output types allow the TTL output of the board (for Arduino 8051 and various microcontrollers) and the RS232 output to legitimately interact with a (PC) are taken. The board will also have sticks or arrangements for attaching the microphone and speaker to get + 5V or different estimates of intensity and ground associations. This type of arrangement floats with several modules.

A variety of GSM modem assortments and GSM modules are available on the market. For our corporate interface a modem or a GSM module for Arduino and thus the sending and receiving of SMS with Arduino - in any case it is a good choice to choose a perfect Arduino GSM module - this is a GSM module with TTL.

Notes on GSM Module

1. We use the SIM900 GSM module - this implies that the module supports matching in the 900 MHz range. We are from India and most of the portable system providers in this country are operating in the 900 MHz band. If you are from another country you need check the versatile system bandwidth in your area. Most portable systems in the US operate in the 850 MHz band (the band is 850 MHz or 1900 MHz). Canada basically works with a 1900 MHz band.

2. Check the power requirements of the GSM module - GSM modules are manufactured by various organizations. They all have different specifications for information control. You must check your requirements for the control of the GSM module. In this exercise, our GSM module

requires 12 volt information. So we fed it with a DC power source of 12V and 1A. I've seen GSM modules that require 15 volts and a few different types that only need 5 volts. They vary depending on the manufacturer. If you have a 5V module, you can control it directly from the Arduino 5V.

Note:- GSM modules are made by connecting a specific GSM modem to a printed circuit board and then configuring RS232 throughput, TTL throughput, microphone and speaker interfaces, and so on. The most popular modem used is SIMCom's SIM 900 gsm modem. They also make GSM modems in Groups 850, 300 and other repeating groups.

3. Check for TTL output pins on the module - You can legitimately amplify the GSM module information for the Arduino only if the module is enabled with TTL power pins. Otherwise, change the RS232 information to TTL using the MAX232 IC and feed it into the Arduino. Much of the GSM modules on the market are equipped with TTL yield pins. Just make sure you buy the right one.

3.1.9 IOTGecko

3.2 SYSTEM ARCHITECTURE

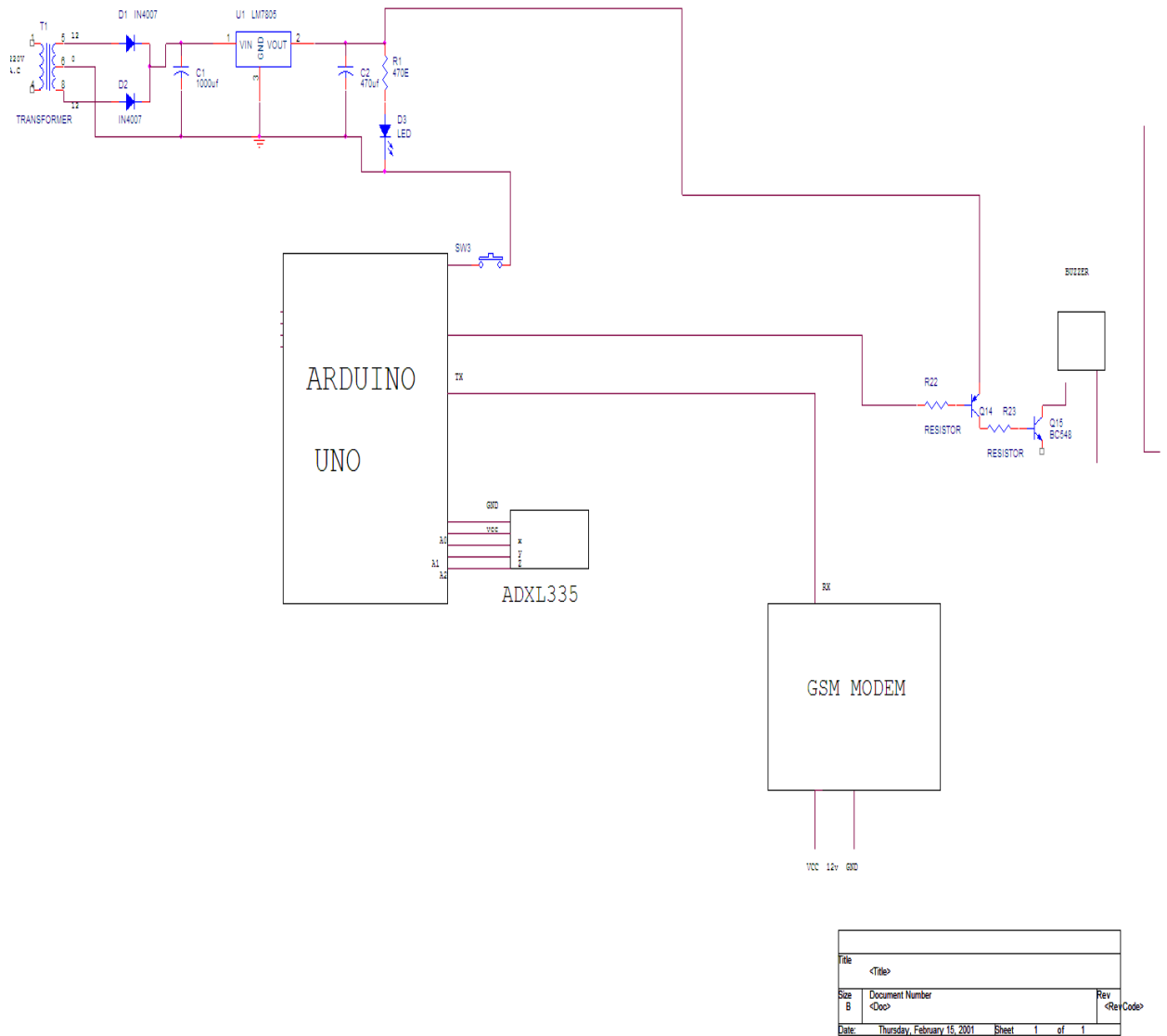
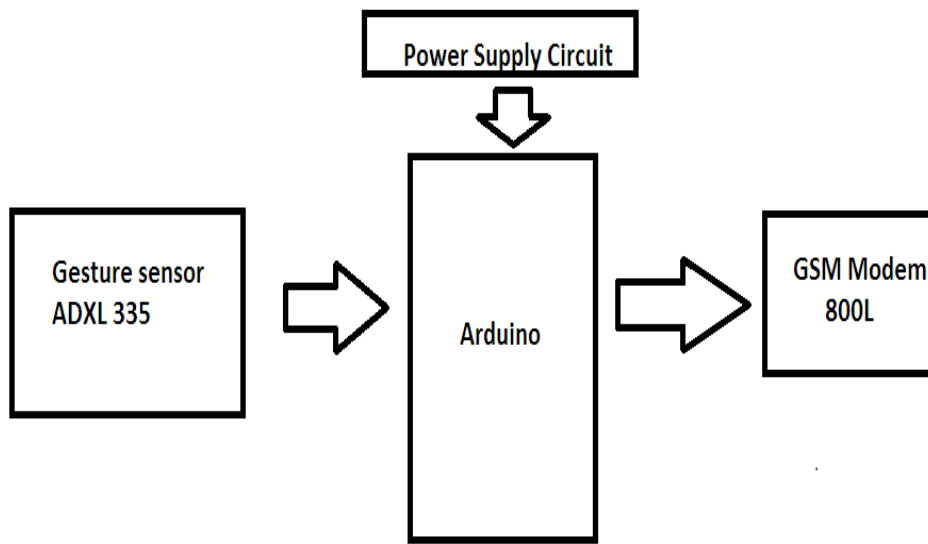


Figure 15: SYSTEM ARCHITECTURE

3.3 Block Diagram :



BLOCK DIAGRAM

Figure 16: Block Diagram

Chapter -4

ALGORITHMS

Stage 1 Model creation: A choice trees-based model is worked from Sis Fall dataset¹⁵. The choice tree is generally utilized for information grouping, and it is extraordinary compared to other techniques for arrangement and relapse among numerous different calculations as it utilizes a non-parametric basic plan which makes it compelling for taking care of substantial size datasets without the overfitting issues exceptionally basic in other ML calculations. Also, choice trees can be effortlessly changed over to characterization rules¹⁶. We utilize BigML Data Analysis instrument ¹⁷ to make the demonstrate. BigML is a product as-a-support of ML, intended to make prescient models and implant them into programming applications by RESTful APIs.

Stage 2 Model preparing: In our work, the SisFall records are utilized at first to prepare the model. Hence, the show learns of the fall occasions recognized by the Smart IoT Gateway. SisFall is an arrangement of freely accessible information for benchmarking and creating of fall identification frameworks. This dataset contains records from 38 members, of which 15 are elderly people matured somewhere in the range of 60 and 75 years of age. Every single elderly member's recreated exercises of ADLs and just a single of these members reenacted the two falls and ADLs, who is a specialist in Judo. The signs were caught in research facility tests utilizing three inertial sensors (2 accelerometers: ADXL345 and ITG3200, what's more, 1 spinner: MMA8451Q) incorporated in a self-created inserted gadget. Both speeding up and whirligig signals were procured with a testinate of around 200 Hz. The elderly member performed 19 sorts of ADLs and 15 kinds of fall. In this work, 3 sorts of fall are distinguished, which are appeared in th e Table 2. In our framework, the preparation dataset used to make the model incorporates 955 ADLs records and 2865 falls records caught by the ADXL345 accelerometer. This information speaks to explicitly the progressions of speeding up (crests) delivered by the falls.

Stage 3 Falls Prediction: In order to fall detection, the big data analyzer creates a local instance of the model. The predictions are created and computed taking as input data the information coming from the transformation module by using the REST APIs provided by BigML. If the result of prediction is a fall, the system invokes to the emergency alert handler and send the falls data to the cloud services.

4.1 Buzzer

Crisis cautions handler sends notices of the fall occasion alongside the GPS position of elderly individual's house to the gatherings in charge of the consideration of the elderly individuals recently enlisted in the framework utilizing a MQTT broker. This data likewise is sent to the cloud administrations. MQTT is picked on the grounds that it is a lightweight and secure IoT convention. MQTT gives end-to-end anchored correspondence and dependability dependent on SSL. Likewise, it fuses a few dimensions of nature of administration to affirm the conveyance of messages, from a non-ideal least dimension to a twofold acknowledgment level. Since our framework is firmly identified with the elderly's medicinal services.

4.2. Cloud Services

Cloud Services get the falls data from Smart IoT Gateway and store them utilizing MongoDB. Once a fall happens, the model is again made and prepared in the cloud utilizing the API REST of BigML, for its resulting be privately instantiated in the entryway.

4.3. Evaluate

For assessment of the proposed framework, a sum of 12 controlled analyses were performed: 9 examinations of falls and 3 tests of ADLs. Three subjects (volunteers) between the ages of 40 and 60 took part in the tests. The wearable gadget was put on the volunteers' midriff. The falls were reenacted in no specific arrange. At first, a few tests were performed to tune the framework parameters. The outcomes got after the tests are broke down utilizing different measurable parameters like

Accuracy, Precision, Gain or Recall. These parameters are characterized by ideas of genuine positives (TP), genuine negatives (TN), false positives (FP), and false negatives (FN) as follows:

$$Accuracy = \frac{TP + TN}{TP + TN + FP + FN}$$

$$Precision = \frac{TP}{TP + FP}$$

$$Gain = \frac{TP}{TP + FN}$$

RESULTS AND CONCLUSION

RESULTS

Results of the project build by us are shown in the following figures:

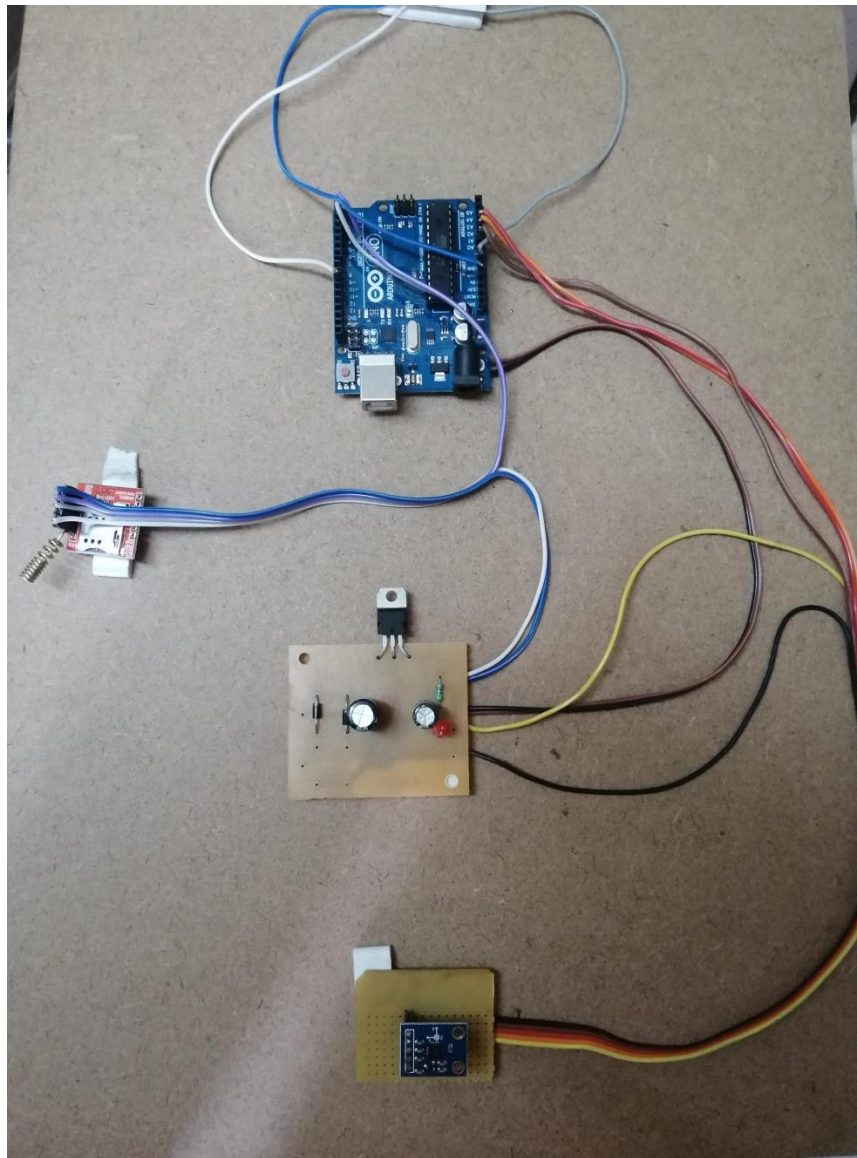


Figure 17: Result Image 1

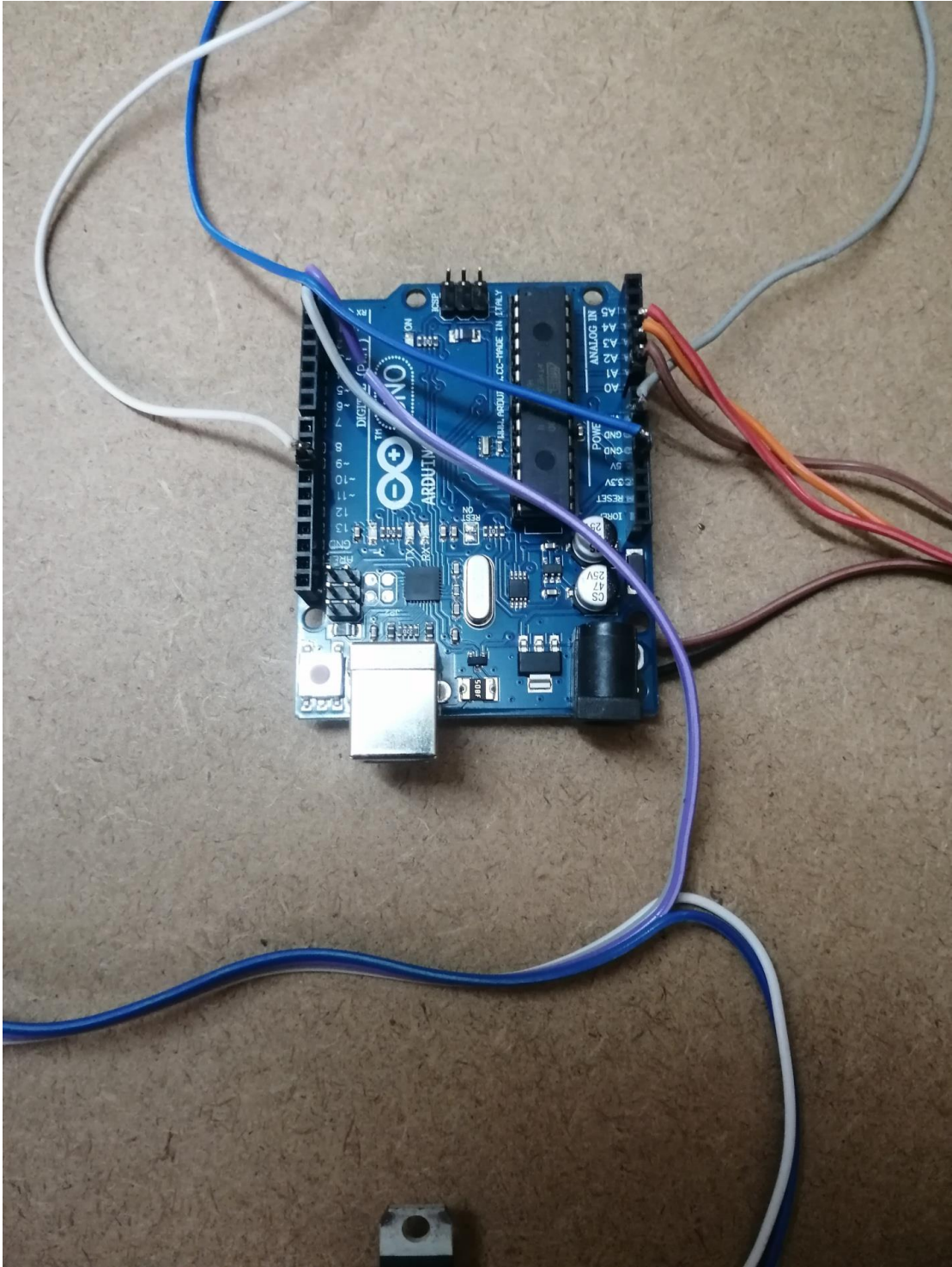


Figure 18: Result Image 2



Figure 19: Result Image 3

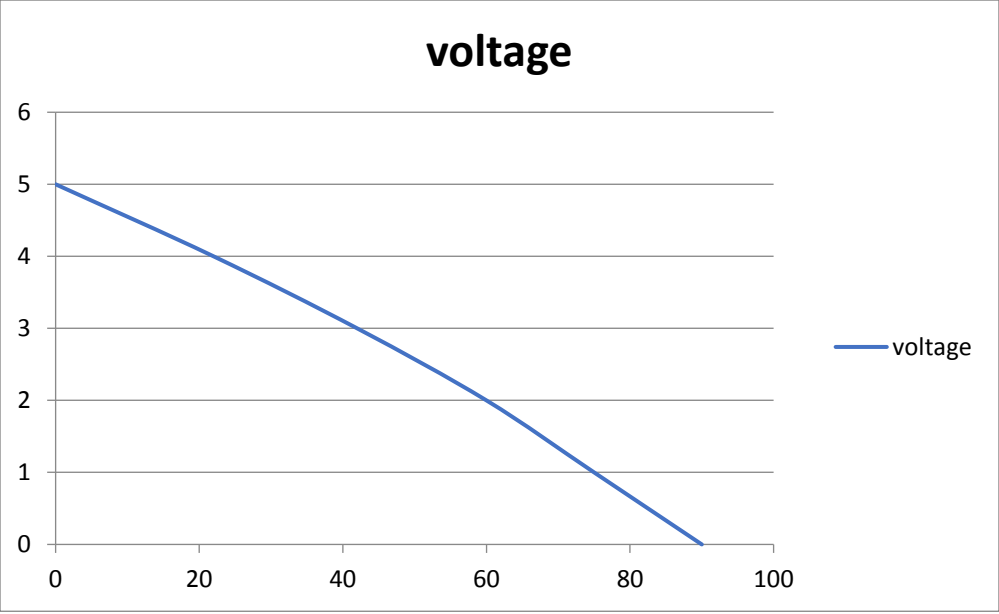


Figure 20: voltage vs angle

CONCLUSION

A programmed and savvy technique for identifying human falls latently by observing the floor vibrations was talked about. Other than defeating a large portion of the regular downsides of the presently accessible fall finders, the outcomes from the controlled research facility tests for this indicator were to a great degree empowering. The outcomes demonstrated that the depicted indicator may well outflank other fall identifiers, in actuality, applications. Controlled examinations led to test this fall identifier demonstrated that the locator had 100% genuine positives and 0% false alerts, contrasted with SIMBAD, the main other latent and non-prominent fall indicator, which could just recognize 35.7% of the real falls in controlled research center tests.

Future scope A Future research course will be to test the execution of this fall indicator with human subjects in controlled setting and to direct handle preliminaries with the potential client populace. Also making the device more compact for easy convenience of the client.

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